

REMARKS

Applicants amend claims 1-4, 6-11, 13-17, 19-23, and 25-26. No new matter is added. Support for the amendment can be found throughout the specification and at least at page 11, lines 14-20, page 20, lines 13-17, and page 21, lines 1-18. Claims 5 and 12 are canceled. Hence, claims 1-4, 6-11, and 13-26 are pending, of which claims 1, 8, 15, and 21 are independent. Applicants respectfully submit that the pending claims define over the art of record.

Claim Rejections Under 35 U.S.C. §112

Claims 4 and 11 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Applicants amend claims 4 and 11 to address the Examiner's concern. Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 4 and 11.

Claim Rejections Under 35 U.S.C. §102

Claim 8 is rejected under 35 U.S.C. §102(b) as being anticipated by United States Patent No. 5,971,247 to Gentry (hereafter "Gentry"). Applicants respectfully submit that the Gentry reference does not disclose that a buffer member is deformable and that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by amended claim 8.

The Gentry Reference

The Gentry reference discloses performing friction stir welding with backing bars 50a 50b which are supported by support columns 312a, 312b, and 312c. The support columns 312a, 312b, and 312c are adopted to prevent the backing bars 50a and 50b from deflecting so that the depth of penetration of the welding post can be constant. See Col. 4, lines 17-36. In other words, the backing bars 50a and 50a cannot be deformable, otherwise it will cause problem for friction stir welding. In contrast, the buffer member is deformable as required by amended claim 8. Additionally, the Gentry reference does not disclose the limitation that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by amended claim 8.

Furthermore, the Gentry reference teaches away from the claimed invention. A general object of the claimed invention is that backing jig (an unjoined portion) can be reliably removed after friction stir welding is performed, during which the backing jig is attached to the workpieces. In contrast, in Gentry, a load is applied to the workpieces by the welding post and the rollers when friction stir welding is performed and that the backing bars 50a and 50a may not be reliably removed from the workpieces.

Accordingly, the Gentry reference does not disclose each and every element and limitation of claim 8. Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claim 8.

Claim Rejection Under 35 U.S.C. §103

Claims 1-6 and 8-25

Claims 1-6 and 8-25 are rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 5,769,306 to Colligan (hereafter “Colligan Patent”) in view of United States Patent No. 3,229,884 to Franklin et al. (hereafter “Franklin”) and further in view of United States Patent No. 2,362,505 to Smith (hereafter “Smith”). Applicants respectfully submit that the combination of the Colligan Patent, the Franklin reference, and the Smith reference do not teach or suggest that a buffer member is deformable, as required by amended independent claims 1, 8, 15, and 21. Applicants also respectfully submit that the combination of the Colligan Patent, the Franklin reference, and the Smith reference do not teach or suggest that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by amended independent claims 1 and 8.

The Colligan Patent

The Colligan Patent teaches a friction stir welding method that ensures weld root closure. A recess in the backing device is used and beads are formed during the process of friction stir welding. However, the Colligan Patent does not teach or suggest a buffer member being deformable that are used in between the backing device and the workpieces, as required by independent claims 1, 8, 15, and 21. The Colligan Patent also does not teach or suggest that the

first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by claims 1 and 8.

The Franklin reference

The Franklin reference does not teach or suggest the use of friction stir welding in joining two workpieces. The Franklin reference teaches how to reduce the size of the back-up bar that can be used in welding cylindrical tubular structures. The size of the back-up bar is reduced by dividing the bar into back-up segments. The Franklin reference does not teach or suggest a buffer member being deformable, as required by independent claims 1, 8, 15, and 21. The Franklin reference also does not teach or suggest that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by independent claims 1 and 8.

Applicants respectfully submit that the Franklin reference teaches away from the claimed invention. The Franklin reference teaches that segments 17 are assembled to from the back-up bar and the contact surface plates 25 are pressed against the inner surface of the cylindrical body by the inflatable bladder 27. See Col. 2, lines 49-60. If friction stir welding is performed under such arrangement, the contact surface plates 25 may detach from the workpieces when the workpieces expanded by the frictional heat caused by the welding process. Furthermore, a relatively large pressing force would be required to be applied by the back-up bar to the workpieces if friction stir welding is performed and the contact surface plates 25 would not be able to bear such large force.

In contrast, in the claimed invention, the first and second cylindrical members (workpieces) are thermally expanded and then shrunk to allow the backing jig to be fitted into the workpieces. When the workpieces expand, the amount of heat applied to the workpieces is larger than the frictional heat generated during friction stir welding so that the workpieces do not detach from the backing jig during the process of friction stir welding.

Furthermore, there is no motivation to combine the Franklin reference with the Colligan Patent. The Franklin reference teaches the back-up bar for large workpieces that are large enough to accommodate humans therein and the back-up bar are formed of segments and hence

has a complex structure. Due to the large size of the workpieces, many contact surface plates are used to approximate the shape of the inner side of the workpieces. Colligan has simple backing members to use with the friction stir welding process hence there is no motivation to complicate the device used in the Colligan reference with the teachings of the Franklin reference.

Additionally, the Colligan reference is not suitable for use with such large workpieces like the ones in the Franklin reference as it will make the friction stir welding method disclosed in the Colligan reference very difficult or impossible to perform.

The Smith Reference

The Smith reference teaches that weld metal 13 is melted by welding and is supported by and fused with fiber tape 16. An object of the Smith reference is to provide a means to insulate the weld metal from the backing stripe. The fiber tape 16 prevents the weld metal 13 from contacting the backing stripe 14. Applicants respectfully submit that the fiber tape 16 only has enough strength and rigidity to support the weld material 13 but not enough strength and rigidity to function as a backing member at the time of friction stir welding. In other words, if the fiber tape 16 in the Smith reference is used as a backing member, the fiber tape 16 will break at the time of friction stir welding and will not be able to prevent the workpieces from contacting the backing stripe 14 and hence defeats the purpose of the Smith reference.

In contrast, the buffer member of the claimed invention is required to be deformable but at the same time rigid enough to bear the pressing force of the probe without breaking or damaging at the time of the friction stir welding. Therefore, Applicants respectfully submit that the Smith reference does not teach or suggest a buffer member of the claimed invention. Additionally, the Smith reference does not teach or suggest that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by claims 1 and 8.

Accordingly, Applicants respectfully submit that the combination of the Colligan Patent, the Franklin reference, the Smith reference do not teach or suggest a buffer member is deformable as required by independent claims 1, 8, 15, and 21. The combination of the references further does not teach or suggest that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, as required by

independent claims 1 and 8. Applicants respectfully request that the Examiner reconsider and withdraw the rejection of independent claims 1, 8, 15, and 21.

Applicants respectfully note that the dependent claims also recite separate patentable subject matter. As such, for this and the reasons set forth above, Applicants respectfully submit that the dependent claims also define over the art of record.

Claims 7 and 26

Claims 7 and 26 are rejected under 35 U.S.C. §103(a) as being unpatentable over the Colligan Patent in view of the Franklin reference and the Smith reference, further in view of United States Patent Application Publication No. 2002/0142183 to Colligan (hereafter “Colligan Publication”).

Claims 7 and 26 depend on claims 1 and 21, respectively. As set forth above, the combination of the Colligan Patent, the Franklin reference, and the Smith reference do not teach or suggest a buffer member being deformable, as required by independent claims 1 and 21. Applicants respectfully submit that the Colligan Publication fails to cure this deficiency.

The Colligan Publication

The Colligan Publication is cited by the Examiner to show that the workpieces can have a thickness of not more than 2 mm. Without characterizing the Examiner’s analysis of the Colligan Publication, Applicants respectfully submit that the Colligan Publication does not teach or suggest a buffer member being deformable, as required by claims 1 and 21. Claim 1 further requires that the first cylindrical member and the second cylindrical member are relatively expanded as compared with the backing jig, which is also not taught or suggested by the Colligan Publication.

Accordingly, the combination of the Colligan Patent, the Franklin reference, the Smith reference, and further in view of the Colligan Publication, do not teach or suggest each and every element and limitation of claims 7 and 26. Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 7 and 26.

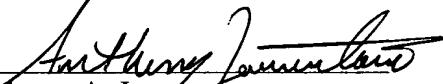
CONCLUSION

In view of the above amendment, Applicants believe the pending application is in condition for allowance.-

Applicants believe no fee is due with this statement. However, if a fee is due, please charge our Deposit Account No. 12-0080, under Order No. TOW-060 from which the undersigned is authorized to draw.

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Respectfully submitted,

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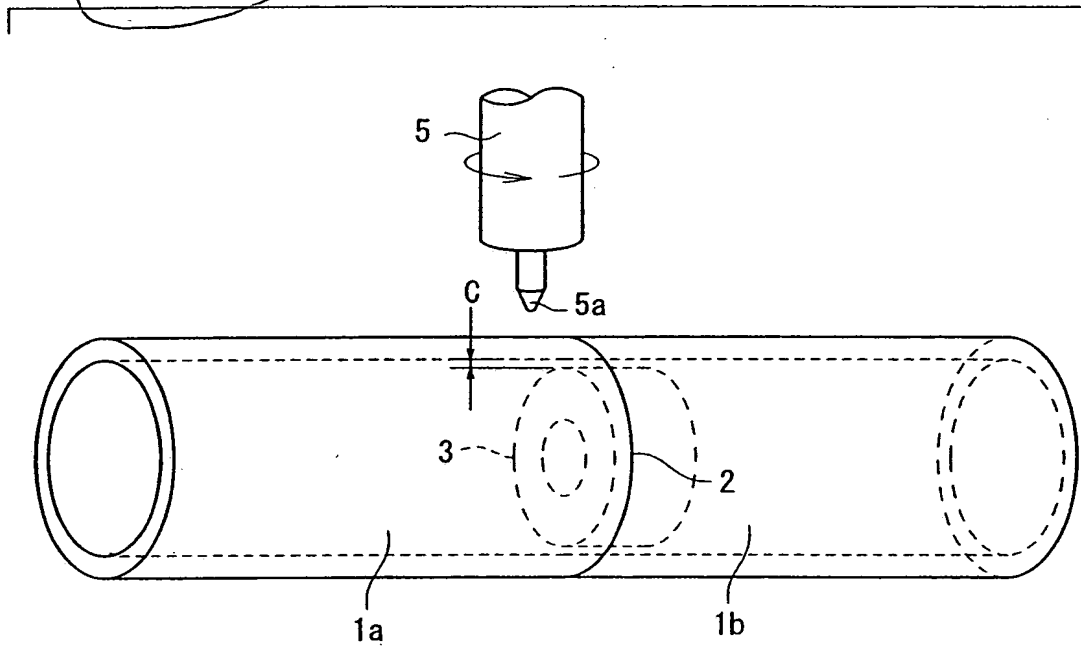
Attachments

AMENDMENTS TO THE DRAWINGS

The attached sheet(s) of drawings includes changes to Figs. 18-20.

Attachment: Replacement sheet
 Annotated sheet showing changes

18/20

FIG. 18
(Prior Art)

19/20

FIG. 19
(Prior Art)